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PINON PINE.

Pinus edulis Engelm.

Piñon pine is of considerable economic importance because it forms, with various kinds of juniper or "cedar," extensive woodlands in regions too dry for other kinds of timber. Its small size and crooked form, however, limit its chief commercial usefulness to supplying fuel, small poles, and posts, although it is sometimes used for railroad ties and mine lagging; its edible seeds find a ready market. Piñon forests are also of some value as a protective cover to prevent erosion.

Three allied species are called "piñons," and are often confused with this tree—four-leaf pine, single-leaf pine, and Mexican piñon. These species grow, for the most part, farther west or south than the true piñon. Four-leaf pine is confined to California and never grows with piñon. Single-leaf pine is found in the western part of the range of piñon, and can be distinguished by its single leaves, since the leaves of the true piñon are usually in bundles of two. Mexican piñon mixes with the true piñon in the extreme southern part of its range; its foliage is finer and its cones smaller than those of the true piñon.

RANGE.

Piñon is distributed from the eastern slope of the Rocky Mountains in Colorado and New Mexico, the mountains of western Texas and a few localities in central Texas, westward to central Utah and western Arizona, and from the southern border of Wyoming south into the mountains of northern Mexico. In altitude it occasionally reaches 8,800 feet and descends to 5,500, but its forests are usually found between elevations of 8,000 and 6,500 feet. Since it is one of the most drought-resistant of pines, it grows on south and west exposures below the altitudes at which most other trees, except junipers, oaks, mesquite, and a few other species, exist.

CLIMATE.

The climate in which piñon grows is dry, with great daily and fairly wide annual variations of temperature. At some points within its range the annual temperature extremes are 110° and −25° F., but usually the annual range is not greater than 126° F. In the winter the average minimum varies with locality from below 15° to about 25° F., while

in summer the mean maximum temperature is from 65° to 75° F. During the vegetative season in the spring the mean temperatures vary from minima of from 30° to 35° F. to maxima of from 57° to 65° F.

The maximum precipitation varies through the range of piñon from 11 to 25 inches and the minimum from 5 to 10 inches. As a rule it is rather unevenly distributed through the year; in the South it is usually heavier in the summer months than at any other season. The winter snows vary in depth from less than a foot to more than 5 feet.

Throughout the range of piñon three-fourths of the days are sunny and the humidity is comparatively low.

ASSOCIATED SPECIES.

Piñon seldom forms extensive stands. It grows most commonly in mixture with one-seed, alligator, Utah, or Rocky Mountain junipers ("cedars"), in open, stunted, or orchard-like stands. It usually preponderates in the higher parts of these forests, leaving the juniper a little more abundant in the lower portions. Throughout its range it is mixed with western yellow pine and occasionally with stunted Douglas fir at higher altitudes, and with the so-called "scrub oaks," *Quercus gambelii* and *undulata*, lower down. In the South it grows with a number of other small oaks and hardwoods, and together with Mexican piñon, Arizona cypress, and junipers, is often a conspicuous member of the woodland type of forest in Arizona and New Mexico.

HABIT.

Piñon rarely grows more than 50 feet high and 2½ feet in diameter, and its usual size when full grown is from 10 to 35 feet in height and from one-half to 1½ feet in diameter. In exposed situations its outline is very irregular, but roughly globular, and it has no clear length. In favorable localities trees in the open have very short clear lengths with very regular globular or egg-shaped crowns, while trees in stands have greater clear lengths—sometimes as much as 25 feet—and narrower crowns. The crowns of young trees in good situations form broad, compact pyramids.

Since piñon trees do not clear readily, except in the most crowded stands, they usually bear a general resemblance to orchard trees, a characteristic shared by their most common associates, the junipers. The trees often gain a grotesque appearance from the retention of unsymmetrical dead branches.

The root system is lateral and extends from 5 to 15 feet from the tree. There is often a short taproot 1½ to 2 feet long.

Piñon leaves are borne in clusters of two or sometimes three. They are from three-fourths to 1½ inches long and are more densely clustered on dwarf trees in exposed places than on the larger trees in better situations. The cones are about the length of the needles and almost as

broad as long. They have relatively few scales, between which the large, nut-like seeds are borne. The stout branchlets are orange in color for the first two years, and then become light gray or dark brown. The bark is from one-half to three-fourths and rarely 1½ inches thick, flatly ridged, and grayish brown in color. The wood is relatively light, soft, and subject to more rapid decay in contact with the soil than that of the junipers.

SOIL AND MOISTURE.

Piñon is very drought-resistant. Among its common associates only the junipers and a few small hardwoods are more so. The best stands are found on deep, well-drained gravelly sands or loams, but it will grow on very shallow rocky soils, where soil moisture is scant and evaporation rapid. Extensive stands are often found on the less fine-grained adobe soils, but such growth is not so thrifty as on coarser soils. Since piñon requires good drainage, it is often confined to lower slopes or to ridges or even slight rises a few feet above the general level of plateaus or plains.

The relative ability of piñon, yellow pine, and Douglas fir to withstand drought at altitudes of from 6,000 to 7,000 feet is shown by the restriction of the fir to the canyons, and of the yellow pine to the lower slopes, while piñon grows at the top where the soil is scant and the moisture content low.

TOLERANCE.

In early youth piñon requires some shade, since it is then dependent on surface moisture, and must have protection from too rapid evaporation. As it matures, however, it becomes less tolerant of shade than any of the junipers, pines, or other conifers with which it grows.

GROWTH AND LONGEVITY.

Piñon has been known to reach an age of 369 years, but is ordinarily much shorter lived. Under moderately good conditions for growth it becomes merchantable for fuel and posts when only about 5 inches in breasthigh diameter, and from 15 to 18 feet high, dimensions which it attains often as early as the twenty-fifth year.

SUSCEPTIBILITY TO INJURIES.

Although the hardiest pine in the Southwest, piñon is less resistant to either drought or late frosts than the junipers. It is sometimes damaged by false mistletoe, but less so, as a rule, than yellow pine. Windthrow and fungous diseases rarely do material damage to piñon, but weevils often severely injure the seed crop.

REPRODUCTION.

Piñon often begins to produce seed when only 10 or 20 years old and 3 or 4 feet high, but the largest yields are from mature trees. Seasons

of especially abundant production occur, as a rule, at intervals of from five to seven years, although heavy crops are sometimes produced for two or three consecutive years, and the heavy seed years are not the same throughout the range of the tree.

During seed years a single mature tree will bear from 1 to 8 bushels of cones. The cones average from 10 to 20 seeds apiece, but from 8 to 20 per cent of the seeds (sometimes as high as 85 per cent) are ordinarily infertile. Wind is not an important agent in the distribution of the heavy, small-winged seeds, but squirrels and other small rodents which store up the seeds for winter consumption undoubtedly leave many in places suitable for germination and growth.

Besides the destruction of seed by rodents, birds, and man, one of the chief factors limiting reproduction is the absence of moisture when needed for germination. Dry seasons may sometimes preclude germination altogether. Since their vitality decreases rapidly, the seeds rarely survive a dry season, even if they escape destruction by animals. Seeds usually fall and germinate upon purely mineral soil.

MANAGEMENT.

Where piñon grows in mixture with juniper or Arizona cypress, these should, because of their superior durability, be reserved for posts and for other uses where the wood is to come into contact with soil, while the piñon should be used primarily for fuel. The chief aim in marking cordwood should be to utilize the mature timber and at the same time to provide for a future stand by leaving numerous well-distributed seed trees. The cutting should be done by selection, which should be regulated largely by the amount of reproduction on the ground. Where there is sufficient reproduction to insure a future stand, cutting may be fairly heavy, but care should be taken to leave a partial shade for young seedlings. Where danger from fire is great the brush should be piled in openings and burned, but otherwise it may be loosely piled or scattered, since it acts as a mulch to conserve soil moisture for germination and affords shade to young seedlings. In all cases merchantable dead and dying timber should be taken out before the thrifty timber is cut, in order to afford a good basis for future cutting.

Approved:

JAMES WILSON,

Secretary of Agriculture.

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